



## FOOD SAFETY RESEARCH: A FOCUS ON

# Salmonella

Salmonella is the most frequently reported foodborne illness in the United States, and is the second most common foodborne illness worldwide. The incidence of human salmonellosis varies depending on the geographic, demographic, socioeconomic, meteorological and environmental factors. The case rate can be approximately one to three hundred per 100,000 population. In 1996, the CDC documented 39,027 salmonellosis cases in the U.S.

The Salmonella family includes over 2,300 serotypes of bacteria, but only two types, Salmonella enteritidis and Salmonella typhimurium, account for about half of all human infections. Strains that do not cause symptoms in animals can affect humans and vice versa.

Salmonella bacteria have been known to cause illnesses for more than 100 years when it was discovered by Dr. Daniel Salmon. Initially, the Salmonella serotype associated with foodborne illness was S. typhimurium. Then in the 1980's, a public health concern emerged with S. enteritidis since it was capable of systemic colonization of poultry, leading to widespread contamination of raw eggs or lightly cooked food containing eggs.



*Salmonella are mainly gram-negative rod-shaped bacteria.*

Since the 1990's, a specific type of S. typhimurium known as a definitive type (DT)104, has become a problem in the United Kingdom, Western Europe, and recently in the United States. Strains of S. typhimurium DT 104 are invasive and may contain large plasmids conferring resistance to antibiotics such as ampicillin, chloramphenicol, streptomycin, sulphonamides, tetracycline, trimethoprim and ciprofloxacin.



*USDA researchers develop a new poultry vaccine for Salmonella enteritidis. The eggs of vaccinated chickens will be tested for S. enteritidis.*

## GENERAL FACTS

Environmental factors such as temperature, pH, and water activity affect pathogen survival.

Salmonella grows in foods within the range of 7-54°C. The optimum temperature for growth is 37°C.

Salmonella can live for up to 7-14 days on the surface of fresh fruit, such as melons. If fruit is stored at 40°F (4.4°C), the organism will not multiply.

A pH of 4.6 is not adequate control in pasteurized food. Some Salmonella spp. can multiply at a pH of 4.1 so egg products used in production of sauces and dressings must be kept at 4.1 or less.

## RESEARCH AREAS

- Understand the molecular ecology of Salmonella and develop effective intervention strategies to reduce their transmission in livestock.
- Use a novel genetic system to identify Salmonella proteins that are essential for growth, virulence or antibiotic resistance.
- Determine the effect of stress on the migration and numbers of Salmonella in swine.
- Develop improved methods for detecting Salmonella enteritidis (SE) infections in laying flocks and SE contamination in eggs.
- Develop a poultry vaccine against Salmonella enterica serovar Enteritidis.
- Investigate why Salmonella enteritidis strains vary in their ability to contaminate eggs and why it is the only serotype to routinely contaminate eggs.
- Determine whether Salmonella enteritidis infections are exacerbated in commercial hens that are undergoing molt via feed withdrawal.
- Monitor animal Salmonella isolates to determine the frequency, characteristics and trends of resistance determinants present in the bacterial population studies.
- Understand antibiotic resistance and prevent its spread and acquisition by other bacteria and other hosts.

## ONLINE RESOURCES

### [S. Enteritidis Risk Assessment. 1998.](#)

USDA. FSIS. *Enteritidis Risk Assessment Team.*

### [Salmonella](#)

*World Health Organization.*

### [Genome Sequencing Center Bacterial Projects](#)

*Washington University Medical School, St. Louis.*

### [Progress Report on Salmonella Testing of Raw Meat and Poultry Products. 1998 - 2002.](#)

USDA. *Food Safety and Inspection Service.*

### [Surveillance for Outbreaks of Salmonella Serotype Enteritidis. 1998 - 2002.](#)

*CDC. Morbidity and Mortality Weekly Review.*

### [The Use of Vaccines for the Control of Salmonella in Poultry. October 2004.](#)

*The EFSA Journal. 2004.*

### [Second Report on Salmonella and Eggs. May 2001.](#)

*Advisory Committee on the Microbiological Safety of Food.*

### [A Possible New Vaccine to KO Salmonella in Chicken Eggs. May 2003.](#)

USDA. *Agricultural Research Service.*

### [Salmonellosis](#)

*NIH. National Institute of Allergy and Infectious Diseases.*

### [Salmonella typhimurium DT 104](#)

*Institute of Food Science and Technology (United Kingdom).*

### [Salmonella](#)

*FDA. Center for Food Safety and Applied Nutrition.*

### [National Program 108 Food Safety FY 2002 Annual Report: Microbial Pathogens](#)

USDA. *Agricultural Research Service.*

### [Foodborne Pathogenic Microorganisms and Natural Toxins Handbook: Salmonella spp.](#)

*FDA. Center for Food Safety and Applied Nutrition.*

### [Food Safety News related to Salmonella](#)

*University of Georgia. Center for Food Safety.*

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<http://fsrio.nal.usda.gov/topics.php>

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